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EUROPEAN JOURNAL OF SPATIAL DEVELOPMENT

Refereed article
No. 68
August 2018

To cite this article: Mäenpää, A. & Teräs, J. (2018). In Search of Domains in Smart Specialisation: Case Study of Three Nordic Regions, *European Journal of Spatial Development,* 68.
Available from: http://doi.org/10.30689/EJSD2018:68.1650-9544

Online publication date: August 2018

The European Journal of Spatial Development is published by Nordregio, Nordic Centre for Spatial Development and Delft University of Technology, Faculty of Architecture and Built Environment.
ISSN 1650-9544

Publication details, including instructions for authors:
http://www.nordregio.org/ejsd
Indexed in Scopus, DOAJ and EBSCO

In Search of Domains in Smart Specialisation

Case Study of Three Nordic Regions

Antti Mäenpää and Jukka Teräs

Abstract

The European Union has promoted regional smart specialisation strategies for some years, and several studies on this topic have focused on key concepts such as the entrepreneurial discovery process and good implementation practices. However, the definition and the role of the domain in regional smart specialisation settings is largely missing, despite it being an important outcome of a successful entrepreneurial discovery process. This article aims to fill this research gap by establishing what a domain entails as a theoretical concept, its role in the entrepreneurial discovery process and how it has featured in regional smart specialisation strategies. Our study analyses and compares three smart specialisation strategies in the Nordic regions of Lapland (Finland), Värmland (Sweden) and Nordland (Norway), focusing on the understanding and adaptation of the domain concept. The results indicate that the regions have managed to establish domains, even though the concept itself has not been adopted in the regions because of insufficient clarification of the term.

Keywords: *smart specialisation, entrepreneurial discovery process, domain, innovation policy*

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1. Introduction

In recent years, European regions have been preparing smart specialisation strategies. A smart specialisation strategy was developed as part of the European innovation strategy approach by the European Commission's Knowledge for Growth expert group, with the aim of promoting European innovation activities (and competing against the United States and Japan) by focusing on regional strengths (McCann & Ortega-Argilés 2013; Barca 2009; Foray & Van Ark 2007). The overarching idea with smart specialisation is that regions identify their evidence-based innovation activities and attempt to combine them in new ways to provide products and services that are attractive in the global market (Foray & Goenega 2013; Foray et al. 2012). The entrepreneurial discovery process, or "regional entrepreneurship", is promoted by highlighting the knowledge of the markets. In fact, entrepreneurial discovery processes form the very core of smart specialisation (Foray 2017).

Although entrepreneurial discovery processes have been widely studied in terms of different case studies and good practices (see, e.g. Dubois, Kristensen & Teräs 2017; Ylinenpää, Teräs & Örtqvist 2016; Periañez Forte, Marinelli & Foray 2016; Kroll 2015), there has been little interest in another key concept of smart specialisation, namely the domain, despite the fact that it is the outcome of successful entrepreneurial discovery processes. One way to measure this lack of interest is to search for how often the term "domain" is used in the relevant literature. For example, in the smart specialisation strategy documents of the case study regions discussed in this paper, the term "specialisation" is mentioned 134 times, but the term "domain" is mentioned only once. Even in the official smart specialisation guidebook (Foray et al. 2012), "domain" is only mentioned 14 times, whereas "specialisation" is mentioned 175 times.

According to the Smart Specialisation Platform (RIS3 Platform 2017a), a smart specialisation domain is an "R&D or innovation area characterised by distinctive knowledge". The domain concept is a crucial part of the entrepreneurial discovery process and, in our view, it should be properly addressed in regional smart specialisation strategies. Strategy implementation that ignores this concept may result in problems in the future; therefore, the clear research gap in this area indicates that the concept deserves closer examination. In this paper, we present our findings regarding the exact nature of domains and their practical use, thus adding to the literature on smart specialisation.

Many Nordic regions have followed the Southern European regions by actively participating in the RIS3 platform of the European Union (EU), which is located in Seville, Spain. This platform was established in 2011 to give European regions guidance on strategy formulation. The Nordic countries are especially interesting in terms of their strategy implementation processes because they began their regional innovation processes for smart specialisation relatively early and, therefore, have already tackled some of the related practicalities (see Ylinenpää, Teräs & Örtqvist 2016; Lindqvist et al. 2013). In his analysis of European-

wide smart specialisation strategy practices, Kroll (2015) states that Northern European regions have added to the overall strategy process and, therefore, we consider that their views regarding the establishment of the domain concept are worthy of further examination.

In this paper, we explore the adaptation of the smart specialisation concept from the viewpoint of the domain in three non-metropolitan Nordic regions: Lapland (Finland), Värmland (Sweden) and Nordland (Norway). Thus, we include case studies of EU and non-EU members—whereas Finland and Sweden are EU members, Norway is not. It is interesting that Nordland, as a region of a non-EU member state, has also developed a smart specialisation strategy, even though it cannot receive EU structural funds. This highlights the practical use of smart specialisation strategies in regional development.

The article focuses on analysing domains in the smart specialisation literature and interpreting domains in the regions applying the smart specialisation concept. The aim is to gain a better understanding of domains on a theoretical and a practical level. We achieve this by focusing on the following research questions:

- What are the key characteristics of domains based on the smart specialisation literature?
- How are domains translated into practice in regional smart specialisation strategies?

The paper is structured as follows. First, we provide a literature review on the concept of the domain in relation to smart specialisation. Then, we establish domains as structured themes for regional development, which are established in practice through implementation processes. Thus, we emphasise the actual use of the domain concept in practice. The empirical part of the paper tests our interpretation of the domain concept and consists of a comparative analysis regarding understanding and adaptation of the domain concept of smart specialisation in the case study regions. This is conducted by studying the official smart specialisation strategy documents in the regions and by interviewing the regional stakeholders and experts who have been participating in developing their local smart specialisation strategy. The last part of the paper consists of a concluding comparative analysis and discussion.

2. The concept of the domain in smart specialisation

There are several definitions of “domain” in dictionaries, but the most fitting in our context is the description of a domain as “a specified sphere of activity or knowledge” (Oxford English Dictionary 2016) or as “an area of interest” (Cambridge Dictionary 2017). To study the concept of a domain in smart specialisation, it is crucial to pinpoint what it actually entails and how it works in relation to other key concepts. Domains can be described as “end results” of entrepreneurial discovery processes. Therefore, to understand domains, it is important to first understand how an entrepreneurial discovery process works.

An entrepreneurial discovery process and the ability to examine regional activities through an entrepreneurial lens is crucial in smart specialisation, because traditional innovation policies have often lacked knowledge of markets and aimed for top-down, technology-heavy policies (Periañez Forte, Marinelli & Foray 2016: 15). Foray (2015) describes entrepreneurial knowledge as a key enabler of domains that consists of knowledge about technology, markets and competition. Entrepreneurial knowledge is knowledge of the possibilities and hidden potentials of the region and, as Foray (2015) highlights, it is impossible to obtain such knowledge completely without a proper understanding of the perceptions of key actors.

An entrepreneurial discovery process can be described as the collective entrepreneurship of a region, as regional stakeholders gather to discuss and decide what realistic markets potentially exist for regionally produced products. Companies play a crucial role in regional development and are considered important partners in acquiring entrepreneurial knowledge. In addition, it should be noted that universities and various public organisations (especially development organisations) may also possess entrepreneurial knowledge. These sources of knowledge and expertise are especially important for regions that lack significant export-oriented activities (Foray 2015; Foray et al. 2012). It is not surprising that stakeholder activation and good governance have been highlighted in the recent official smart specialisation policy literature (see, for example Radosevic et al. 2017; Gianelle et al. 2016).

Entrepreneurial discovery processes vary by region, but we argue that they include the analysis of existing capabilities and the facilitation of stakeholder meetings, in which regional stakeholders examine and verify the possibilities (Figure 1). Then, smart specialisation strategy objectives and projects implementing the strategy are initiated based on the analysis of regional capabilities and the outcomes of the stakeholder meetings. Most of the regions appear to follow this pattern. Sometimes, regional processes require several iterative rounds before the preparation of the smart specialisation strategy (Vallance 2017; Teräs & Mäenpää 2016).

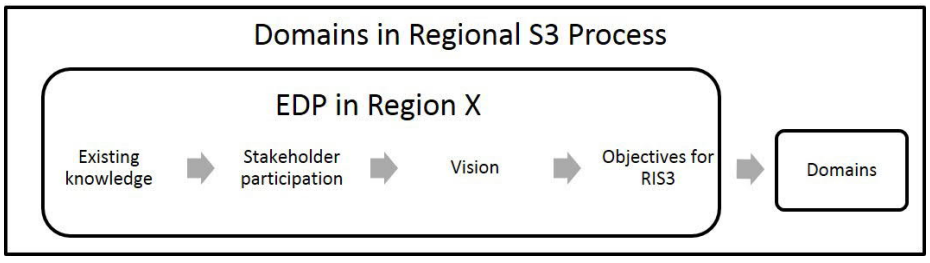

Figure 1: *Phases of the regional S3 process.*

According to Foray (2015), entrepreneurial discovery processes are required to determine the possibilities for domains. He states that the appropriate number of actors for establishing domains is somewhere between single actors and entire sectors (including clusters). In addition, domains may be centred on technological solutions or on new

markets. For example, digitalisation may provide new solutions for the modernisation of existing technologies and new ways to approach global consumers. Regardless of the actual scale or form of activity (transition, modernisation, diversification or radical foundation), the focus of a domain is decided via an entrepreneurial discovery process whereby regional actors present their ideas on specialisation and shape the domain according to local needs and limitations (Foray 2015).

We suggest that one way to understand domains is to view them as "themes" for the region. Collective intra- and extra-regional opportunities/projects are added to these "themes" that direct the emphasis of specialisation, and innovations and activities come out of this "thematic construct". These are the main outcomes of the process for regions, as new resources will be generated and new jobs established. Entrepreneurial ideas are presented by single actors (organisations or individuals) and not by dominating clusters or industries. These different views further enhance the regional innovation process and may lead to further discoveries, which in turn may prompt new domains. In summary, to prepare a regional innovation strategy for smart specialisation, the region, with its companies, clusters and other regional actors, will be initiated into an entrepreneurial discovery process, which stimulates the creation of domains (see Figure 2).

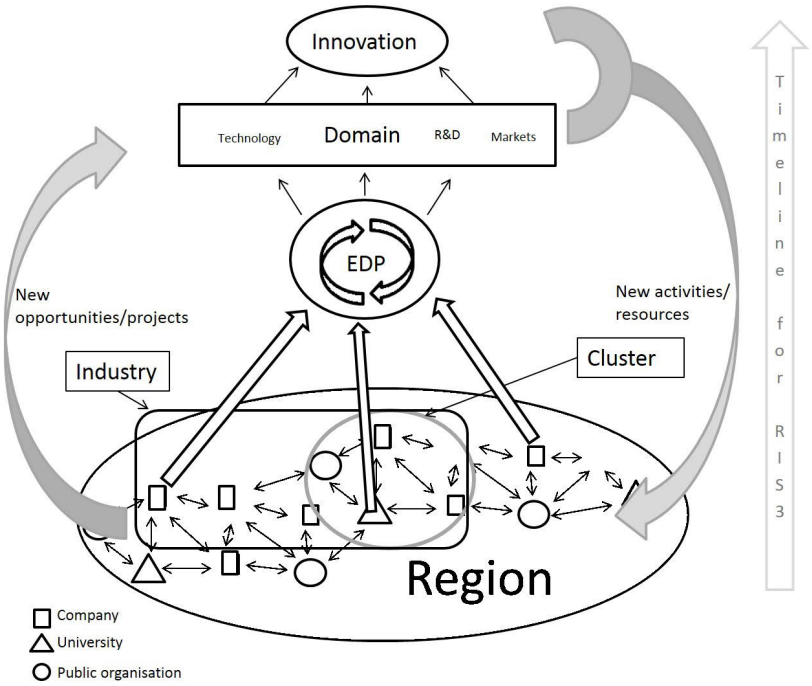

Figure 2: *Domains and the entrepreneurial discovery process (EDP).*

Domains are one way to enhance structural growth (by combining actors) and they offer an opportunity for regions to "brand" themselves on a global level. It has also been stated that domains share similarities with niche markets, as both require distinctive knowledge of the market (international) and the products (local) (Gianelle et al. 2016). One way of understanding a domain is to see it as the human knowledge that is required to create niches, as a precondition for creating something totally new (Gianelle et al. 2016).

One important issue is the focus of domains. Nauwelaers et al. (2014) distinguish between policy domains focusing on thematic prioritisation, which can be based on markets or technologies, and those focusing on functional prioritisation, such as system failure or connectivity problems. The functional focus may uncover gaps in regional networks, and thus reveal new collaboration opportunities that may turn out to be new domains if they are enhanced and prioritised (Virkkala, Mäenpää & Mariussen 2017). Thematic prioritisation is more general than functional prioritisation, but there are examples of regions that focus on improving the functioning of regional networks in addition to adopting a thematic approach (Teräs & Mäenpää, 2016; Virkkala, Mäenpää & Mariussen 2014). Therefore, we suggest that a functional focus can be seen as one theme for specialisation.

Based on the smart specialisation literature (Foray 2015; Foray et al. 2012), one could assume that regions discover domains quickly after strategy formulation, that is, after completing the smart specialisation strategy document. However, there appear to be very few studies on the actual establishment of domains or on initiation and maintenance of domains of smart specialisation. Indeed, domains are often mentioned only briefly, and there has been little elaboration on the subject in policy documents or even in the research on smart specialisation. As they represent the overall results of successful smart specialisation strategy processes, domains should be clearly structured and understood by regional actors. Currently, the definition of domains is somewhat vague in the existing smart specialisation literature and it requires a better explanation.

Often, regional actors and stakeholders are more familiar with the concept of a cluster than that of a domain. However, it should be emphasised that clusters are not the same as domains by definition. Smart specialisation strategies focus on the transformation of regional economies around new, unique and knowledge-based domains, whereas the goal of most clusters is to enhance the performance of the companies that are members of the cluster (European Commission 2013). One feature that differentiates clusters from domains is their scale, as domains may include actors from several clusters as well as other regional actors or even citizens as members. Domains may focus on the same themes as clusters, but they usually also include other elements, such as new technologies, that eventually contribute to regional transformation.

Domains are important because they are the real embodiments of specialisation. Very diverse actors (either individual organisations or clusters) may find new opportunities for co-operation with the help of entrepreneurial discovery processes, discussion and mutual domain identification. Even if local activities are already quite narrowly focused, the discovery of domains can deepen knowledge, as cross-sectoral and mutual communication may spur new ideas. Ideally, domains also stimulate an eagerness to experiment and continue a search for new opportunities.

We claim that one can consider domains as abstract regional themes that manifest in the mutual actions of the regional stakeholders.

Entrepreneurial discovery processes occur at the beginning. Regional knowledge is the basis for such processes, and it is gradually analysed with the help of stakeholder activation. Then, this leads to ideas that form the focus for regional specialisation and complete the entrepreneurial discovery process. Next, specialisation transforms into practice via implementation and related extra-regional collaboration, which are part of domain formulation. An established domain can become a global "brand" for the region, which can be supported or developed by further entrepreneurial discovery processes, forming a positive "circle" of knowledge generation (Figure 3).

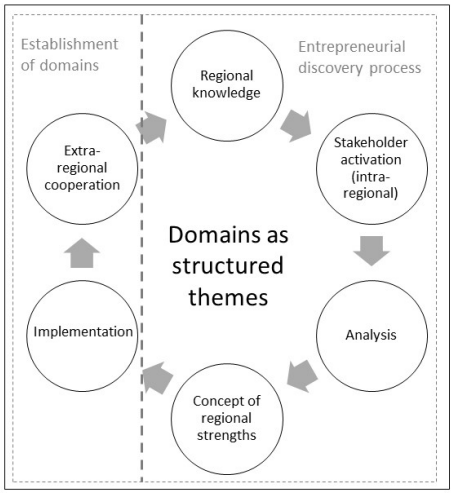

Figure 3: *Key characteristics of domains.*

Although the focus of domains is local-level co-operation, there are prospects for operating on an international level. This understanding of domains' key characteristics is important in our empirical study, as we search for the implications of the domain concept in three different Nordic regions.

Next, we study the actual implementation of the domain concept to understand how domain formulation works in practice. This is achieved by examining the three case study regions and assessing their regional smart specialisation innovation strategies, and also by interviewing regional experts behind the processes. In addition, we ascertain whether the theoretical idea of domains as "structured themes" is maintained in an empirical setting.

3. Methodology and case study regions

3.1 Methodology

The empirical component of the research was conducted as a qualitative analysis, focusing on understanding how the regions have formulated their domains. The study utilised two major sources of data. The core research material consists of the regional smart specialisation strategy documents of the case study regions. Further information was gathered via interviews with experts in charge of strategy preparation, who added to the knowledge about the case study regions and the implementation processes. This was crucial because the case study regions commenced the strategy implementation process after completing the strategy

documentation, and therefore a concrete understanding of the domain concept could not be achieved by analysing the documents alone.

We aimed to interview experts in related strategies; therefore, we focused on interviewees with knowledge of what happened during the strategy process and during the implementation stage. The interviewees were key actors from the case study areas, who were heavily involved in regional smart specialisation strategies and who were able to provide a good overview of the entire smart specialisation process in the region. Owing to their expertise, the respondents were considered to have sufficient knowledge of the cases, and, therefore only one interview was conducted per region; that is, three interviews were conducted in total. All the interviewees were able to explain current progress in the regions and proved to be very valuable sources of information. We provided the interviewees with the following description of the domain concept prior to the interviews:

> The ability to identify opportunities for the region to expand into new domains is a central tenet of the concept of smart specialisation. Domains of R&D and innovation can be understood as new specialisation fields in which a region is likely to excel given its existing capabilities and productive assets (Foray et al. 2012: 12, 63, 113). Nauwelaers et al. (2014) distinguish between policy domains focusing on thematic prioritisation, which can be based on markets or technologies, and those focusing on functional prioritisation such as system failure or connectivity problems. Domains should also focus on activities instead of sectors or individual firms (Foray 2015: 41–42). In choosing their specialisation domains, the regions are expected to take into account two aspects: intra-regional opportunities and inter-regional complementarities or similarities with surrounding regions, or even on a global scale (Iacobucci & Guzzini 2016: 1–2).

The idea was to present the views of others regarding domains, with the above description considered to include the relevant characteristics of domains, as presented in Figure 2. In addition, the interviewees received a list of related references on the smart specialisation literature prior to the interviews. Ten interview questions were provided to the interviewees before the interview. The questions focused on four different aspects of the domain, as follows:

- Understanding of the concept (how is the term "domain" used in the case study region and how it is understood; when was it introduced?)
- Implementation practices (how is the concept utilised and how were the domains formed?)
- The chosen domains (how did they benefit the region and support new activities?)
- The future of domains (how should domains be promoted and how can we determine when they are "ready" or fully-fledged?).

In case the domain concept was not used in the regions, the survey included a question about possible alternatives or similar concepts, in

order to understand how the regions have understood the overall target of entrepreneurial discovery. This was very important during the interviews, as we discovered that the domain concept had not been used in strategy formulation. The analysis provided an interesting insight into how the regions attempt to formulate domains in practice.

We chose the three Nordic regions as the case study areas (see Figure 4) for the following reasons. First, all the case study regions had already prepared and published their regional innovation strategies for smart specialisation. Second, the regions had participated in regional peer review sessions of the RIS3 platform and, thus, their regional strategies had been reviewed transnationally. Third, they all resemble each other in terms of geography (being non-metropolitan areas of Nordic/Northern Europe), population and relative abundance of natural resources. Finally, we could connect with related regional experts in charge of the respective regional smart specialisation strategies, and thus had good access to information about the regions.

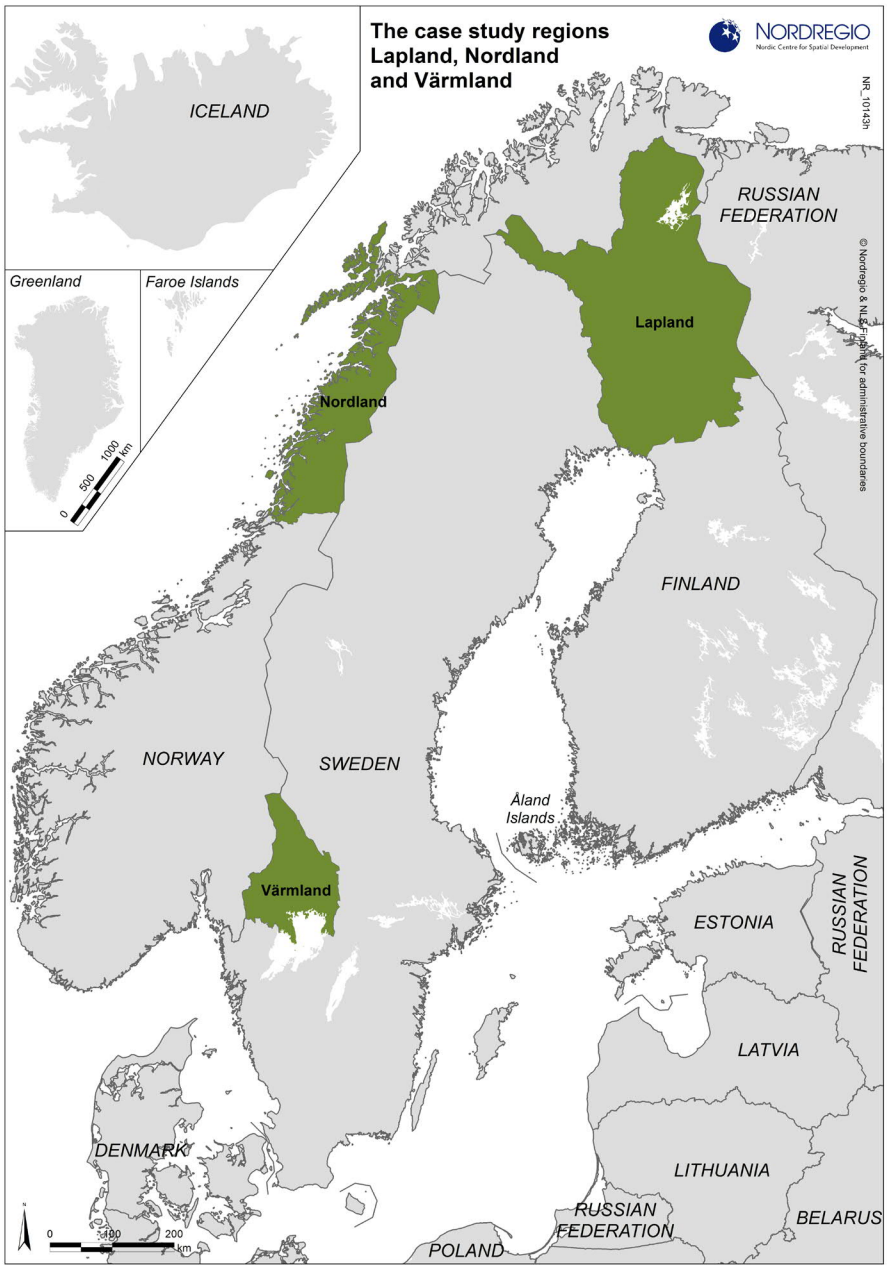

Figure 4: *Case study regions: Lapland, Värmland and Nordland (Map by Julien Grunfelder, Nordregio 16.6.2017).*

The main focus of the study and the interviews was the utilisation and understanding of the domain concept. The idea was to see how the regional smart specialisation practitioners utilise the concept and how they form domains. The research also paid attention to the overall strategy process, mainly to determine how the idea of domains was formulated. Therefore, the main outcomes of the smart specialisation strategies were given more emphasis than other distinctive features of the strategy processes. For this reason, we decided not to focus on national differences when comparing the processes across the case study regions. Although there is no reason to diminish the role of the state in the smart specialisation process (Lundström & Mäenpää 2017), we did not highlight national differences, choosing to focus on understanding how the domain concept was perceived by the regions.

3.2 The case study regions

Nordland is the biggest of the case study regions geographically, covering an area of 112,948 km2 in north-west Norway. Lapland in northern Finland is the second largest (98,982 km2) and Värmland in mid-west Sweden is the smallest (19,296 km2). Nordland has a population of over 470,000, Värmland of over 272,000 and Lapland of over 183,000. Regarding the regional capitals, Karlstad in Värmland has a population of over 137,000, Rovaniemi in Lapland has a population of over 61,000 and Bodø in Nordland has a population of over 50,000. Nordland is the biggest region but also has the biggest population disparity, whereas Värmland has quite a strong centralisation of inhabitants in the regional capital (RIS3 Platform 2017b; RIS3 Platform 2017c; RIS3 Platform 2017d; Region Värmland 2015; Nordland County Council 2014; Regional Council of Lapland 2013).

Lapland is known for its tourism industry and its Arctic expertise in several areas (including Arctic vehicle testing facilities, sustainable utilisation mines, processing industries in Arctic conditions and Arctic bioeconomies). Värmland is mostly known for its steel and forest industries, and Nordland for its extensive fish farming, activities related to minerals, metals, oil and gas and green hydroelectric power. Economically, Nordland is the biggest case study region, as its regional gross domestic product (GDP) is nearly 20.1 billion euros, compared with 8.3 billion euros for Värmland and 5.1 billion euros for Lapland (see Table 1) (Nord University 2017; RIS3 Plat-form 2017a; RIS3 Platform 2017c; RIS3 Platform 2017d; University of Lapland 2017; Region Värmland 2015; Nordland County Council 2014; Regional Council of Lapland 2013).

	Lapland	Värmland	Nordland
Geographic size	98,982 km2	19,296 km2	112,948 km2
Population	183,000	272,000	470,000
Key economic areas	Tourism and Arctic expertise	Steel and forest industries	Fish farming and natural resources
Regional GDP	5.1 billion euros	8.3 billion euros	20.1 billion euros

Table 1: *Case study regions' profiles.*

Sources: *RIS3 Platform 2017b; RIS3 Platform 2017c; RIS3 Platform 2017d.*

The biggest research and educational institutions in the case study regions are Karlstad University in Värmland, which has over 16,000 students; Nord University in Nordland, which has 6,000 students; and the University of Lapland, which has nearly 5,000 students (University of Lapland 2017; Nord University 2017; Region Värmland 2015.)

4. Empirical study of domains in the three regions

4.1 Regional smart specialisation strategies and domain formulation in practice

The smart specialisation strategy processes differ between the case study regions to some extent, although the time frame for the strategy formulation was similar, taking nearly two years in all three regions. Lapland commenced its strategy process first, in 2012, and completed its strategy, Lapland's Arctic Specialisation Programme, in 2013. Nordland does not have a separate smart specialisation strategy document but included smart specialisation in its broader innovation strategy, called Innovative Nordland: Innovation Strategy for Nordland 2014–2020, which was developed during 2013 and 2014. This strategy included consideration of educational policy. Värmland's strategy was formulated during 2014 and 2015, resulting in Värmland's Research and Innovation Strategy for Smart Specialisation 2015–2020.

Lapland undertook several iteration rounds during the strategy formulation process, which involved deciding upon three broad specialisation themes and several sub-themes. The main themes were the refining of Arctic natural resources, such as mining industry resources, the utilisation of natural Arctic conditions (e.g. the tourism industry) and cross-cutting development to enable Arctic growth (e.g. supporting industries such as information and communication technologies). Lapland produced 50 specific proposals for action for the period 2014–2020 to develop these themes and sub-themes. Analyses of existing capabilities and interviews with stakeholders were implemented and company viewpoints were gathered via surveys. After the strategy formulation, in 2015, the Regional Council of Lapland undertook an analysis of all the projects implemented in Lapland in the period 2007–2013, which were co-funded by European regional development funds and European social funds. These projects were regrouped into 10 major categories and, after consultation with major actors in Lapland (the public sector, the research and education sector and the private sector), the following five smart clusters were introduced: the Arctic industry, Arctic rural networks, Arctic design, Arctic security and Arctic development infrastructure clusters.

The region of Värmland focused on potential growth markets, entrepreneurship within the area and whether it was possible to devise solutions to deal with societal challenges (e.g. diversification of jobs between men and women) within the region. A business intelligence analysis was conducted to obtain an idea of the international potential of the region. Stakeholder meetings with broad "triple helix" participation

(i.e. involving the public sector, companies and universities) were arranged under various sub-groups to devise different specialisation fields (Region Värmland 2015). Värmland developed four different categories for specialisation. The first, transverse specialisation (value-creation services), involves more general specialisation, and therefore is not necessarily important for the development of domains. However, the region developed three other categories: prioritised specialisation (including a forest-based bioeconomy, digitalisation of welfare services and advanced manufacturing and complex systems); specialisation under qualification ("upcoming" specialisation), which includes nature, culture and place-based digitalised experiences and system solutions with photovoltaics (solar energy); and finally, new smart specialisations yet to be discovered (Region Värmland 2015; Foray et al. 2012).

Interestingly, Nordland used a similar method to the Finnish region of Ostrobothnia in its smart specialisation strategy; the two regions worked together during the strategy formulations because they wished to develop comparable data and to promote transnational learning (Virkkala, Mäenpää & Mariussen 2014). Researchers from both regions devised a tool that measures the overall connectivity and depth of regional co-operation in a triple helix setting. However, the tool is aimed more at improving regional stakeholder co-operation (and entrepreneurial discovery processes) rather than specialisation and domains. Nordland specialises in three distinctive areas: the seafood industry; the processing of metals, minerals, chemicals and machines; and experience-based tourism activities. The chosen fields were based on earlier R&D and practical studies and are all export-oriented, as originally proposed by the smart specialisation guidebook (Nordland County Council 2014; Mariussen et al. 2013; Foray et al. 2012.)

None of the regions discussed "domains" during their strategy implementation processes. This was an interesting discovery and is indicative of the complex nature of the term. However, our analysis of regional strategies revealed established phases in domain formulation (such as intra- and extra-regional aspects and stakeholder activation; see Figure 2), which indicated that domain formulation was occurring on a de facto basis, even though the exact term was not used. It appears that the regions were aiming to achieve the overall objectives of smart specialisation and used the word "specialisation" rather than "domain" to describe the outcomes of the entrepreneurial discovery processes. Lapland introduced the term "smart cluster", which was regarded as a domain; using the term domain was considered to be overly complicated because there is no explicit, uniformly agreed Finnish translation of the word. It was considered that companies in Lapland would understand and adopt the "smart cluster" concept more easily, even though the regional council was aware of the fact that domains are not clusters per se. Smart clusters are seen as cross-sectoral ways to specify the existing capabilities, and therefore serve as preliminary steps for domains.

The interviews revealed that, in Värmland, the domain concept is not used in the official smart specialisation strategy document because the term was not utilised during the strategy preparation phase. The

term domain is mentioned once in the local strategy but only in relation to the former specialisation trend of the region. The region instead used the term "smart specialisation" to describe the goals of the smart specialisation strategy. Despite the word "domain" not being used, Värmland produced specialisation fields that resemble domains. These combine existing strengths into new formats, which include different clusters and industries. One major tool for new specialisation seems to be digitalisation, as this has been adopted in many of the chosen fields. These specialisation fields add to the existing industries and may provide new combinations for future products and services in the region.

Again, in Nordland, the word "domain" is not used in the official innovation strategy document (Nordland County Council 2014) or even in the case studies that were used to develop the smart specialisation strategy. Domain was not used because the term was not explained to the officials who wrote the documents. Instead, Nordland has used the words "specialisation" and "diversification". Nevertheless, Nordland has used "domain thinking" extensively; for example, oil rig technologies have been converted for use in the fish breeding industry (to provide deep water pumping for fish refineries) in the region. Overall, there have been many studies regarding cross-sectoral linkages prior to the development of the smart specialisation strategies (e.g. Mariussen 2014), and the term may have been left out because these activities (although known by different names) were already occurring. The concept is now becoming more familiar and is gradually being used more in the region.

All three regions emphasised that their domain formulation broadens innovation capabilities by providing a solid regional framework for innovation activities. Lapland and Nordland emphasised the possibility for cross-sectoral collaboration, whereas Värmland explicitly mentioned the possibility for increasing related variety. In addition, the regions emphasised the possibility of increasing the connections between regional innovation actors. This supports our view of domains as regional themes that are realised through mutual projects.

Lapland was keen to increase the efficiency of its smart cluster activities by enhancing its product and service portfolios, thus increasing the visibility and marketing of the smart clusters. Smart clusters are expected to highlight their close contacts to the business community and to avoid being seen as too academic or remote from the real world. Värmland aimed to increase co-operation with the university regarding smart specialisation projects in the future. Co-operation on digitalisation is mentioned as one way to do this. Nordland has long-term (10-year) plans and is continuing studies related to enhancing the innovative capabilities of the region. One concrete example is a new centre for education and co-operation in process engineering that was established prior to, but assists in strengthening, the smart specialisation strategy.

Region	Lapland	Värmland	Nordland
The use of the domain concept in the regional smart specialisation strategy documentation	Term not mentioned directly, but cross-sectoral thinking has been utilised to form the themes for specialisation Thematic specialisation	Term was mentioned directly but had a different meaning. However, the region has used clear combinations of existing industries, products and services in a "domain-like" fashion Thematic specialisation	Term not mentioned directly, but previous studies already include "domain thinking" Indirect functional and thematic specialisation
Domain formulation in practice (entrepreneurial discovery process)	Interviews, workshops, analyses, company surveys, statements from the stakeholders, peer review sessions with RIS3 platform	Former R&D, analysis of the region, workshops, draft consultations, gender analysis, societal challenge analysis, peer review sessions with RIS3 platform	Former R&D, analysis of the region, questionnaires, focus group interviews, peer review sessions with RIS3 platform
Domains/focus areas for smart specialisation in the regional strategies	*"Smart clusters":* Arctic industry, Arctic rural networks, Arctic design, Arctic security and Arctic development infra-structure (N.B. "smart clusters" introduced only after the completion of strategy process, as part of implementation phase)	*General specialisation:* Value-creation services *Prioritised specialisations:* Forest-based bioeconomy, advanced manufacturing and complex systems and digitalisation of welfare services *Specialisations under qualification:* Nature, culture and place-based digitalised experiences and system solutions with photovoltaics (solar energy)	Seafood industry, process industry (metals, minerals, chemicals and machines) and experience-based tourism activities (Maritime, green energy, services)
Domain focus	Market	R&D/Technology	R&D
The interpretation of domain during the implementation phase (after the strategy document was written)	Smart clusters involve "domain-like" thinking. Current work is being done to brand the chosen clusters and make them work, especially according to needs of companies	"Domain thinking" has been utilised; digitalisation in particular seems to be the key. The chosen specialisation fields are strengthened based on funding	Clear "domain thinking" has been utilised. New studies are underway to strengthen the chosen specialisation

Table 2: *Domains in case study regions*

Source: *Based on interviews; Region Värmland 2015; Nordland County Council 2014; Regional Council of Lapland 2013.*

4.2 Major findings

The three regions share many similarities in terms of their overall process and use of the domain concept (Table 2). All the regions have formalised their strategies without using the term "domain", largely because the term was not emphasised in the strategy writing process. However, the regions developed their own domain-type concepts, such as specialisation, diversification and smart clusters. Värmland was the only region to mention the term "domain" in its regional smart specialisation strategy document, but used it to describe a past regional

focus. As noted above, in Lapland, the term was not used because there is no equivalent word in Finnish and it was considered that companies would identify with and better understand the word "cluster", which used as the basis for Lapland's chosen term, "smart clusters".

The regional smart specialisation processes were also very similar in the case study regions and closely followed the entrepreneurial discovery process presented in Figure 1. The regions first gathered existing knowledge, then contacted the regional stakeholders (via surveys, forums, etc.) and discussed the possibilities for specialisation. After this regional consultation and formalisation of the vision, the regions wrote the strategy documents. At present, with the strategy preparation completed, the regions have established ongoing projects that aim to advance specialisation, and thus the formation of domains. Lapland and Värmland have focused on a more thematic specialisation compared with Nordland, but the latter has also emphasised functional specialisation by studying the triple helix connections between universities, companies and public organisations. Finally, all case study regions presented their regional smart specialisation strategies in RIS3 platform peer review meetings to gain further transnational insights.

All the domains in the regional specialisation strategies were selected by the regions on the basis of their previous knowledge of regional assets and capabilities; however, new combinations and original strategies were put forward as well. Värmland, for example, has utilised key enabling technologies (i.e. digitalisation) to form its domains and has even left some of the domains open, in order to pursue them in the future. Lapland had not given in-depth consideration to regional clusters previously, but now it is focusing on establishing innovation environments to support the smart clusters. Lapland developed the idea of smart clusters during its implementation phase (i.e. after writing its strategy document), which clearly indicates progress in its regional thinking. Nordland had a strong culture of R&D before it developed its smart specialisation strategy, but it is deepening co-operation and collaboration with other regions transnationally to learn from their experience.

In Nordland, the established domains will be further developed in the future, as the region focuses on new research and continues the entrepreneurial discovery process. Lapland wishes to strengthen its smart clusters via marketing and it is continuing to cooperate with vocational institutions and universities. Värmland is deepening its collaboration with the local university and is anticipating more EU resources to further that co-operation. The region also wishes to utilise digitalisation to formalise new services/products. It appears that all case study regions have recognised the need to continue developing their domains and, interestingly, have chosen the three different aspects (market, R&D or technology) of domains (mentioned by Foray 2015) to meet their goals. Nordland is focusing more on R&D-based development, Lapland is focusing on markets and Värmland is using new technologies via digitalisation.

It is noteworthy that the regions are taking different paths in developing their domains. For example, Lapland has developed "smart

clusters", which involve ongoing entrepreneurial discovery processes, as well as cross-sectoral co-operation. Lapland has included innovation environments, thus developing a concrete innovation infrastructure (e.g. Arctic development infrastructure) for the region during the smart specialisation implementation phase. Värmland has included the idea of utilising key enabling technologies (digitalisation) and has emphasised societal challenges in its smart specialisation strategy. Nordland has successfully combined oil pumping technology with fish farming and, thus, had clearly developed cross-sectoral products even before the smart specialisation process took place, and without having acknowledged the concept of domains.

The respondents all agreed that the related thought process and the newly-established domains help regional actors by presenting distinctive targets for future development. Domains also clarify the regions' innovation needs for local stakeholders and help in the branding of the regions. The case study regions wish to strengthen the chosen domains and hope for fruitful co-operation among the relevant actors. Although the overall results are yet to be seen, there are clear indications of development in domains, as the case study regions have included the different phases and are ending their first round of domain formulation.

Interestingly, although the case study regions did not use the term domain, they nevertheless operated according to smart specialisation strategy guidelines. The three regions understood the ideas underlying specialisation and this idea of regional specialisation perhaps even surpassed the idea of domain in its clarity. The regions utilised stakeholders and formulated ideas for regional strengths before the implementation phases. Analyses included extra-regional thinking, as the regions focused on global markets and, in future, they hope to achieve wider participation. Generally, the smart specialisation strategy processes and the related entrepreneurial discovery processes were quite similar, but the regions derived these on their own terms rather than using the existing ones. Overall, the results of this study indicate that domains or their equivalents using other names have been established, and that the overall domain formulation process is proceeding according to the smart specialisation strategy guidelines (Foray et al. 2012).

5. Conclusion

The study began with a literature review that established the basic concept of a domain, as well as its key characteristics. Some descriptions highlighted knowledge types (RIS3 Platform 2017a) and others focused on the size of the participating entities (Foray 2015) or the nature of the chosen specialisation (Foray 2015, Nauwelaers et al. 2014). We established domains as a concept for practical use and developed the idea of domains as thematic constructs that are formalised into practice via implementation and extra-regional collaboration. This description not only takes into account previous domain descriptions and discussions in the smart specialisation literature but also highlights the idea of the concrete establishment of domains and places stakeholders and local facilitators at the centre of the process.

We suggest that one way to open up the concept of domain is to understand it as a broad, cross-sectoral description of the spectrum of major themes that the region might focus on in its future activities. These themes are expected to be based on existing regional capabilities and usually focus on either technology and/or markets and/or R&D. The key idea is to use intra- and extra-regional thinking during the process. Domains should be formulated and integrated into the practices of regional innovation in order to fully utilise smart specialisation thinking in regional development. We stress that this description of domains might be useful for non-metropolitan regions (which tend to have limited resources), as it emphasises the role of local actors, which is often central to regional development in non-metropolitan regions.

Our understanding of the domain concept was empirically tested through an analysis of three case study regions, which revealed that the concept of the domain remains somewhat vague, particularly among regional practitioners. Obviously, smart specialisation is only in the first stages of implementation, but at the same time, the feedback indicates there is a need for additional clarification of the domain concept. We found that usage of the term was not very prominent in the process of strategy-making or that it did not even translate into the local language, as in the case of Lapland. Therefore, we argue that there is a need for systematic clarification of all the relevant terms used in smart specialisation strategies, especially "domain".

However, despite the perceived vagueness of the concept, the key characteristics of domains (regional specialisation, stakeholder activation, intra- and extra-regional focus, a focus on established strengths) were translated into the smart specialisation strategy practices within the case study regions. Regional co-operation has resulted in the utilisation of entrepreneurial discovery processes to create a regional focus. Domain formulation has been relatively similar in the different regions, despite the fact that the regions focused on different themes. The interviewees felt that domains could be used to focus regional development and stimulate co-operation among stakeholders. This emphasises the idea of domains as thematic constructs that are realised during implementation. This knowledge may prove to be valuable to public actors who can now view domains as planning tools for regional specialisation.

Currently, the challenge is to push regions to move forward in terms of the proper establishment of domains and their translation into practice. Based on our study, this occurs through implementation projects and extra-regional collaboration. Many regions are obviously strengthening their specialisation with projects and by applying for funding from various sources to promote development in Europe. However, there should be more studies that address the lessons learned. In addition, there is a need for new ideas on how to continue the (evidently) successful entrepreneurial discovery processes and regional specialisations. One interesting avenue of progress might be the integration of entrepreneurial discovery processes within domains that are similar to "smart clusters", as illustrated in the case of Lapland.

Overall, the idea of continuing entrepreneurial discovery processes within and alongside domains is an interesting one that requires further research.

One important issue related to the future of domains is governance. For example, who should lead or govern the development process of the domains? As Morgan (2017) points out, both the public and the private sector may lack knowledge of the subject. Companies might have very limited resources for activities outside of their main income area (and may even have additional goals that do not fit vis-à-vis the overall strategy process). Universities might provide the necessary theoretical knowledge on domains and already have the necessary research connections, but their experience and knowledge in terms of practical implementation might be limited.

If we consider the fact that, in practice, public actors (e.g. regional councils) organise smart specialisation strategies, then we might assume that they will continue their work on already established domains. However, do they have the necessary skills to see what is happening inside the domains? Do they have the resources to keep track of the local, national and global events that affect the domains? Public actors should also seek co-operation among other global domains and their relevant actors. One possible solution could be co-operation with the RIS3 Platform in Seville, which has a transnational coordinator role that may aid future collaboration among domains. We suggest that the RIS3 Platform should fully embrace this role and establish connections with different regions to ensure the flow of information between European actors.

However, the direction in which the regions should proceed with their overall smart specialisation processes remains undetermined. Should the focus be on domains established during the strategy formulation, or should the regions seek additional specialisation via entrepreneurial discovery process iterations? Interestingly, Foray (2015) suggests that four to six years might be an appropriate cycle for an entrepreneurial discovery process, after which there should be new suggestions for future domains. This may work well in some regions, but non-metropolitan regions, in particular, might have to face the fact that the chosen domains stay the same if there has been no further development to create or strengthen additional domains. Then, should the regions try to establish a nonevidence-based, radical foundation (Foray 2015) to achieve new domains or just support the existing ones? Regarding the future research agenda for smart specialisation domains, we suggest that more studies on successfully established domains and their management should be undertaken, as this will be necessary to provide a solid foundation for the future direction of domains. By further developing domains and the thinking behind them, we can enhance the future of European innovation.

Acknowledgement

The authors would like to thank Åge Mariussen (Nordland Research Institute), Kristiina Jokelainen (Regional Council of Lapland) and Anders Olsson (Region Värmland) for valuable comments regarding the case study regions. The authors would also like to thank Julien Grunfelder (Nordregio) for the production of the map of the case study regions and Seija Virkkala (University of Vaasa) for comments regarding the overall article. This article, however, reflects only the views of the authors. Last, but certainly not least, the authors express their gratitude to the anonymous reviewers and editors for their valuable comments.

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